

Peruvian Andes, 1972

Roger J. Bowser
Julian M.H. Coward
Mary J. Coward

Lloyd W. Tunbridge
Geoffrey Wadge
John A. Walkington

The study of caves in South America is still in its infancy, probably because it is so isolated from the major caving communities of the world in Europe and North America. Much exploration remains to be done in Canada and America and with Mexico and Guatemala within reasonable distance of North America it is, perhaps, not surprising that the expeditions to visit South America have been European. Previous work has been done by South Americans in Brazil, Venezuela and a little in Peru. Also a Polish expedition visited Peru in February 1972 making significant discoveries.

The Imperial College expedition to Peru was prompted by the large areas of limestone in the country and the apparent lack of exploration. Enquiries to the Institute of Geological Sciences revealed that Dr Cobbing had been working in Peru for some years. A visit to him proved fruitful: he was able to tell us about an abundance of dolines in his area and show us some very interesting aerial photographs – looking like the surface of the moon in places. Reference to other geological material on the surrounding terrain suggested that this area would be a good one to look at. The karst is formed in massive Triassic limestone dipping to the south-west at 25° and capped by volcanics. Regional folding and faulting are evident, with some blocks dipping at nearly 90° . La Cueva de Huagapo is the main resurgence for the catchment area of several square kilometres.

A team of people were selected – four from London and two from Hamilton, Ontario – and an expedition programme was drawn up. Then came the hard work, getting support and organizing food and equipment, etc. Finally after a hectic Easter we breathed a sigh of relief when the expedition food and equipment was finally loaded on board ship in London bound for Callao, Peru.

Departure

At last on 23 June we set out to follow our gear, flying by BUNAC to Toronto, where we were met by Julian and Mary; the only mishap being that the duty-free drinks did not come with the plane and Geoff lost a camera and some clothes. After a festive weekend in Hamilton

we left for Miami in Julian's battered station wagon and checked in at a hotel on Miami Beach at 3 o'clock Wednesday morning after a 39 hour drive stopping only for food, fuel and repairs. Wednesday was spent sightseeing in Miami and we left the airport for Quito, Ecuador, early Thursday morning and spent a day there, arriving in Lima the next afternoon.

It was too late to do anything about our gear before the weekend so we hired a jeep for a reconnaissance trip into the area – 15km east of Oroya (see map). We left Lima in the early evening and camped for the night near the road, having climbed 3,650m in five hours. The next day we continued up this spectacular road, climbing steeply through gorges and round mountains, until finally we crossed the Andes watershed at the Anticona pass, 4,843m, and emerged on to the rolling plateau country of the altiplano. We stopped for fuel at Morococha and then drove up the track past Pucara to Puna-bamba. Our first impressions were disappointing, but we spent the afternoon looking at shake-holes and sinkholes and then left for Oroya. We were now beginning to feel the effects of sor-



oche (altitude sickness) but most people only suffered from slight headaches. On the Sunday we looked at the limestone surrounding Oroya and then drove over the top of the limestone on a dirt road to Tarma, stopping for the night half-way over. This limestone looked more promising and several sinkholes were seen. The next day we drove over to Tarma and then back to Lima, arriving at tea time. We eventually checked into a hotel and returned the jeep.

Lima is a city full of contrasts, for the people living there include some of the richest and poorest in Peru. The south-west of the city near the Pacific Ocean abounds with modern houses and apartments, whilst to the east there are the shanty towns full of Indians who came to Lima seeking work and found only disillusionment. Downtown Lima and Callao are built in the Spanish colonial style; the buildings are usually a drab brown and cream colour and are often badly maintained and dirty. The climate in Lima is depressing in July; the city is covered by cloud and the humidity is 100 percent, with temperatures around 23°C. It never actually rains in Lima and so all the buildings have flat roofs and the older ones are not even waterproof. Likewise there is no street drainage. On the very rare occasions when it does rain the city grinds to a halt in chaos. Our hotel in downtown Lima was in the colonial style and must have been one of the best hotels in Lima in its day with its high rooms, corridors and marble floors, but now it has fallen to the ranks of one of the cheapest (which suited us admirably).

The rest of the week was spent in seeing our customs agent and trying to get our gear through customs. It transpired that the only thing holding it up was that a banker's guarantee had to be transferred from a London bank in Lima to the customs – this eventually took five days having to go via an intermediate Peruvian bank. The time was not wasted however; we spent much of it buying maps and aerial photographs and were able to start working on these. We also spent a lot of time visiting people in Lima who were to prove very helpful to us.

Pirhuacocha

Eventually our gear was released from customs and on Tuesday 11 July we left Lima with it bound for Pirhuacocha. We arrived at our

chosen camp site near Lago Pirhuacocha at 6 pm. We were all suffering from *soroche* so we quickly unloaded the lorry, put a couple of tents up by the side of the track and turned in for the night. The following two days were spent in establishing base camp underneath a sandstone outcrop near the road at 4,450m and also in moving most of the boxes of supplies over to the camp. On Friday, Lloyd and Geoff went into Oroya to see the geologists from the Cerro de Pasco Corporation; they had some useful discussions and stopped to see the Jefe de la Region at Pucara on the way back. By the weekend we had moved all the boxes over to the camp, most of the effects of *soroche* had disappeared and we were feeling fit enough to start exploring the area and doing some preliminary mapping. One of the first interesting finds was a raft of fossilized trees, some up to 10 metres long and a metre in diameter. We were woken that night by a rather drunken cowboy from the hacienda at the end of the track and in the morning we noticed that a small box was missing, but this was the only incident we had; our relations with the local population were generally very friendly.

The weather at the site was very variable, though predictable. The days normally dawned bright and clear at 6 am and temperatures in the sun were about 27°C falling to about 15°C in the shade. The sky usually clouded up by mid-afternoon with occasional precipitation, invariably snow and hail. The sun set at around 6 pm, night coming quickly with temperatures down to -10°C. Towards the end of August the weather became noticeably worse and several days' continuous snow cover was not uncommon – this hampered geological work to a certain extent.

Whilst Lloyd and Geoff mapped the area surrounding base camp, John and Rog went on a preliminary trip over to Saco in the east of the area to check up on reports of caves over there. During our walk over to Saco we noticed a line of shakeholes up to 20m deep, with one of them taking a stream, along the sandstone-limestone contact south east from base camp. A short dig in one of them seemed promising so it was marked down for a future visit. That evening, Thursday 20 July, we camped near a small farmstead in the Saco valley. The next day we moved camp to Saco and Rog looked at some limestone to the south of Saco, find-

ing no caves, while John chatted up the locals in the village. They showed us a resurgence near the village. It was static when we saw it, it flowed up dip and so was sumped but drains quite a large area and obviously has some cave behind it. The locals seemed to know about some caves on the other side of the valley so we arranged to go there the next day with them as guides. Part of the bargain it seemed was to play football with them the following morning; this tends to be hard work at 4,000m a.s.l. and perhaps explains the prowess of South American soccer teams internationally. Eventually we left to look for the caves. Several hours later we were still unable to locate any, though we gathered from a shepherd that there were rock shelters over the next ridge, so we returned to the village, hitched a ride up the road to Pucara and walked back to base camp.

The next day, Sunday, Rog accompanied Lloyd as he was mapping down to the limestone contact with the shakeholes while Geoff was mapping on the other side of the valley near Puy Puy. During the day Rog was treated to a demonstration of geological mapping. It seemed to consist of staggering from outcrop to outcrop accompanied by strange groaning noises. When the outcrop was reached the geologist would collapse in a heap, attack the rock with a hammer, scribble a few notes and the process would be repeated all over again. We progressed in this manner from the Pirhuacocha valley over to the limestone and back again.

Geoff and Lloyd spent the next few days completing the mapping of the area within easy reach of base camp. John spent a lot of time digging in the promising shakehole in the next valley while Rog passed the time analysing rock samples for Geoff. During one of Geoff's mapping trips he found some interesting looking Cretaceous limestone which he and Rog visited the next day. It appeared to be ideal for caves as it is fairly massive. On closer inspection it was found to have streams flowing over it and later analysis proved it to be dolomite. The following day Lloyd and Rog processed a colour film to check on the photography and exposures. It is surprisingly easy to process colour film in the field, the only requirements being warm water and someone to fetch copious quantities of washing water.

With virtually all the mapping near camp finished, Lloyd and John took four days' supplies and completed the mapping of the south of the area. Geoff was still mapping near Punabamba and Rog continued to analyse rock samples. On Thursday 3 August, Rog and Geoff left with a week's food to map the south east corner of the area. Lloyd and John had returned and the next day they photographed the fossilized trees and found an open shakehole leading to a small cave blocked by rockfall.

On Saturday 5 August Julian and Mary arrived with a few of their friends who were on holiday in Peru. They were all suffering from soroche in varying degrees, having walked nine kilometres from the road. Their friends had recovered sufficiently by Wednesday to walk back to the road again and so they left. Julian, John and Rog had a look at the recently discovered shakeholes and also at John's dig; unfortunately none of them went, all being blocked by collapse of the thinly bedded limestone.

The next day Geoff and Lloyd climbed Puy Puy; it proved to be easy going in good snow with some bad rock at the top. They had a magnificent view of the surrounding area from the Amazonian jungle to the high Cordillera in the north. John and Julian left camp to make another attempt at finding the caves at Saco. They spent two days in exploration above the resurgence and on the other side of the valley, finding only rock shelters. Meanwhile we were entertaining a couple of geologists from the Cerro de Pasco Corporation, who had come to look for a place to build a track up to a prospect near Puy Puy. They seemed interested in our work and were delighted when we presented them with some of our excess peppermints - apparently scarce in Peru. A day later John and Julian returned, and Lloyd and Geoff left to complete the geological map, returning the next day. Julian and Mary then left on a reconnaissance trip to Tingo Maria. We had heard stories of a big tropical cave there containing birds and insects. They returned four days later confirming the stories; it sounded an interesting though imposing cave.

Meanwhile Lloyd and Geoff left on another reconnaissance trip, this time to Palcamayo to look at Huagapo. They found a large resurgence cave in Triassic limestone with sinks 700m above. We decided to pack up and move over

there and so a lorry was arranged with the Cerro de Pasco Corporation for the following Monday. The next days were a hive of activity, Geoff left to visit Arequipa and look at El Misti and the surrounding volcanic rocks, Rog analysed some water samples for Julian, while John and Julian climbed Puy Puy. Lloyd and Rog then surveyed an interesting landslide to the south of camp. Eventually we all spent a day packing up camp for our departure to Palcamayo.

Palcamayo

The lorry arrived at 8.45 the next morning, 21 August. We loaded it up and started the journey to Huagapo, stopping in Oroya and Palcamayo on the way. We finally arrived at Huagapo at 2.30 and found a good spot to camp opposite the cave near Modesto's house. Modesto is the cave guardian, who takes tourists into the cave; we became good friends during our stay at Huagapo. The following day we had a fine breakfast of fresh trout caught by Modesto in the river by the camp. We then quickly got changed and explored Huagapo, taking Modesto and a couple of his friends with us. During the afternoon Julian and John looked at another resurgence on the south side of the valley but it soon choked up.

The weather at this site was noticeably better than at Pirhuacocha. We were lower down, at 3,550m, in a steep sided and sheltered valley. The weather was clear and sunny, and night temperatures remained above freezing. It deteriorated towards the end of September, however, with occasional afternoon rain setting in.

Next morning Julian, Lloyd and Modesto went off up the Ushto gorge — a spectacular gorge over a hundred metres high and only five to ten metres wide in places. Their destination was a pothole just below Milpo village, one and a half hours from camp — la Sima de Milpo. They took little tackle with them and soon ran out at -150m, leaving the tackle in position. Rog and John were lowering the sump in Huagapo but found it harder work than they anticipated, the depth being decreased by only 15cm at the first attempt. Geoff arrived back from Arequipa in the evening. His enthusiasm was soon kindled by our tales of the caves, and so the morning saw all of us trooping up to Milpo with plenty of tackle. We reached the final sump after three hours and made a

start on the survey, arriving back at camp in the evening. Rog drew the survey up the next morning while the others had a photographic trip in Huagapo, Geoff and Lloyd making fresh discoveries. The following day, Saturday, Julian, Lloyd and Modesto went up the valley to Antacocha, 800m above Huagapo, and explored some caves there; unfortunately they choked after a few hundred metres. Meanwhile the rest of the party started work on the Huagapo survey. The next week was spent in a similar manner; the sump in Huagapo was lowered further and a depth gauge installed in a pool at the resurgence — this was faithfully monitored during the rest of our stay.

One evening we were invited to a fiesta at Yanapuquio, the first village up the valley. We arrived to the sound of singing, dancing and revelling and spent most of the evening in a similar manner. A firework display was laid on in the village square around midnight and this was followed by cabaret in the village school hall. We eventually arrived back at camp in the early morning though the fiesta lasted for another two days. The day after the fiesta we went up to look at the caves on Callash Punta — a three hour walk and a climb of 900m from base camp. We were accompanied by a horde of villagers who could not believe that our slowness was due to soroche and they put it down to 'mucho cerveza'. Later on in the week we surveyed more of Milpo and removed some of the tackle in preparation for our attack on Callash Punta. Lloyd also arrived back from his trip to Lima to get maps and aerial photographs of the Palcamayo area.

On Saturday 2 September we piled a huge amount of caving gear, tents, food, etc. into a truck, and we were driven up to Shaca Marca where we were welcomed by the locals and given a house to stay in for the night as well as being invited out for supper. We were cajoled into playing football with the villagers and were later asked to make a map of the village square and design a plaza for it. We intended to take all the gear up to Callash Punta the next morning using burros. These eventually arrived and by mid-day we had all our gear tied on, and the long trek up began. Eventually we arrived on the plateau and set up camp; the only disadvantage with the camp site was that it took an hour to fetch water, and that was from a stagnant pool. We went

down the cave later in the afternoon intending to take some tackle and have a look round. We were rather disappointed when it choked after the third pitch, and so returned to camp leaving surveying, photography and detackling till the next day. The next day Leonardo and Benedicto from the village came up to see how we were doing. Not believing that we could survive on freeze dried food they brought up some potatoes and pork and proceeded to cook it for us on a pachamanca – a stone oven. This was made by heating stones up on a grass fire, then putting the food in the centre of a pile of the hot stones and covering the whole lot up with earth. Half an hour later the food was cooked. We arranged with them to go down the next day and in the morning they turned up with two mules which we used to take the gear back to Huagapo. Meanwhile Julian, Rog and Benedicto went up to the volcanics to look at some shakeholes, but unfortunately all of them were blocked. However, Benedicto did know of some caves nearer to the camp and so the following morning he, Julian and John went up there on horses to look at them. They turned out to be near Antacocha and were two dry sinks going down dip for a few hundred metres. Another cave examined on the way back turned out to be little more than a rock shelter but was of interest as it contained human bones.

The following two weeks were spent consolidating our finds and completing the work. Antacocha caves were surveyed and photographed; dye was put into the sink and detectors were placed at all the possible risings. A theodolite survey was carried out between Huagapo and Milpo and these were tied in to the surrounding hills. The survey of Huagapo was completed and drawn up, as were the surveys of Milpo and the caves near Antacocha – Mata Patla and Conca Loma. Tingo María was revisited and the cave was surveyed and photographed. Julian and Mary and Benedicto embarked on an exploratory trip to some caves near the volcanics, but unfortunately it turned out to be too far to go in a day and so they were left for another expedition. Hydrological work included water tracing, analysis, and flow measurements including rainfall over a period of three weeks. Seven caves were explored and surveyed; the total length of surveyed passage is over 4km and the deepest cave is 417m - a South American depth record. The entrance altitudes are all above 3500m, the highest being 4330m.

The time was rapidly approaching when we would have to leave to arrange export of our equipment in Lima and catch our flights home. However, before we left we arranged to have a fiesta to thank all the local people who had helped us. This was run by Modesto and his family and went off very well. The Police Chief from Tarma came and wanted to go down Huagapo. We found time to take him the following day, before packing up camp to leave. Julio, a local truck owner from Yanapucquio, had agreed to take us and our equipment back to Lima, so having regretfully said goodbye to all our friends we left early on Friday 22 September, arriving in Lima in the afternoon. Most of the next week was spent in arranging for the export of our equipment; we eventually had it all sorted out, after several days of visits to our customs agent. The evening before we left we held a press conference, kindly arranged by the British Embassy, and then had a farewell dinner for our friends in Lima. Early next morning we left Peru by air for Miami and started the long journey home after what we considered was a fairly successful and very enjoyable expedition.

Transport and Customs

Our limited budget did not permit us to have our own transport in Peru, which would have been very expensive. Shipping charges and the cost of taking a vehicle overland from the USA are quite prohibitive. We did budget for those items in our early planning stages (the cost in 1972 was approximately £1,600). It also takes three weeks to travel one way overland and must be ruled out if time is short. Vehicles may of course be purchased in Peru, but prices are very high, and resale could be difficult unless a reliable contact was known. Since we believed our expedition would have relatively little need of transport once our first base camp had been established we decided to rely on borrowed and rented transport whilst in Peru.

Our equipment, about 1½ tons of it, was shipped to Peru on the *Oropesa* by the Pacific Steam Navigation Company. The cost was about £60 per freight ton, thanks to a generous discount from the shippers. Other incidental costs were transport to and from various docks, and customs charges. These added about £30 to our shipping bill. We had to arrange a bankers guarantee for £2000 to cover the import duty on our equipment whilst we were in Peru (food is allowed

in duty free). This was done in London and cost £60 in bank charges in London and Peru. However, it can be avoided by depositing \$400 with the customs in Peru which is returned when the equipment leaves the country. We believe we were relatively lucky with customs in Peru as our goods were already cleared when we arrived and it only took eight days to arrange our guarantee and remove our equipment from the customs. Unfortunately the weight restrictions on air travel meant that we had very little equipment, such as tents and cooking gear, with us and so we were unable to use all of this time very profitably.

Our personal transport to Peru was by an unusual route. First London to Toronto by BUNAC charter (£62 each) where we met Julian and Mary. After a very pleasant weekend in Hamilton we drove down to Miami in Julian's Canadian Rambler Estate, which was in somewhat dilapidated condition (fill her up on oil and check the petrol please). From Miami we flew to Lima via Quito on specially reduced rates from Ecuatoriana Airways. Fortunately we also managed to get a free night in Quito's best hotel and saw a little of the city, thanks to timetable muddles.

Upon our arrival in Lima, which was on a Friday afternoon, we decided that little could be done that weekend towards saving our equipment from Lima customs and so we hired a Toyota Land Cruiser from the Peruvian equivalent of Avis and drove up towards Oroya. Hire vehicles are unfortunately very expensive and our 600 kilometre journey over three days cost us £60. The hire company also stipulated that the insurance for the Land Cruiser was not effective off tarmac roads – this rather restricts one in Peru.

When all our gear was cleared through customs we were fortunate that our customs agent arranged a relative's lorry to take us and the equipment to our first base camp. This trip cost us £24, which turned out to be relatively expensive, though not extortionate. We subsequently learned that trucks can be arranged quite easily in the Parada, which is Lima's market. However a knowledge of realistic prices is invaluable when hiring transport.

Peru is fortunately well endowed with public

transport. There are generally three ways of travelling in Peru:

- 1 Buses, famous for people hanging on everywhere, their spartan seating and their reckless driving. However they are incredibly cheap. The 187 kilometre journey from Lima to Oroya cost about 50p.
- 2 Collectivos, which are taxis that run on a set route and carry five people. On distance journeys, as opposed to suburban trips, the cars have a timetable and it is necessary to book unless a full complement of passengers is found or the difference in fare is paid. This method is fast, reliable (which is surprising, judging by the age of the cars used) and relatively cheap – about twice the bus fare.
- 3 Taxis, which have the advantage that they will leave from where you wish and will carry more luggage than a colectivo, but are consequently more expensive.

Whilst at base camps we found that hiring horses or mules would be relatively easy, but had little use for them except at Shaca Marca where they were generously supplied free by our friends in the village.

Transport between base camps was kindly arranged free by the Cerro de Pasco Corporation at Oroya, who were also very helpful in our geological mapping. Our transport back to Lima from Huagapo was arranged quite cheaply with a local truck owner, whom we had befriended during our stay. Most of the private transport in Peru is by lorry, and there is no shortage of lorry owners looking for cargo.

One minor obstacle to travel in Peru is the number of check points along the roads, where all lorries and buses have to stop for a police check. It is wise to keep your passport handy at these points; however, apart from checking the passport, the police are generally considerate to tourists.

Communications throughout Peru are good though journey times can be long due to the mountainous and often rough roads. Public services serve virtually every part with regularity. Off the beaten track progress is generally easy by foot or mule except in the jungle where the dense forests make progress almost impossible.

On leaving Peru we again encountered difficulty with customs and nearly had to leave one of our members behind to sort them out. However our gear was finally cleared and loaded aboard ship about a month after we left. Incidental costs such as packing, transport to docks and agents charges etc. were £150. One final cautionary note on shipping – our ship was over two months late in docking at London; we dread to think what would have happened if it had been two months late on the outward trip.

Food

During our planning we had envisaged being a considerable distance from any population and therefore decided to be completely self sufficient in all our food requirements. However when we arrived at our base camp we found that the area is populated, as are most of the highlands of Peru, and the locals were disappointed that we would not buy food from them. Meat, corn and potatoes are cheap and plentiful in areas where they are produced (avoid llama meat like the plague). Buying food from local farmers would be a far better proposition than surviving on dried foodstuffs. The only disadvantage with this is that it requires some degree of mobility (i.e. expedition transport) to do this; one's local farmer may only produce potatoes and it may be necessary to travel several kilometres to obtain meat. This would be satisfactory on odd occasions but could waste a lot of time and effort if it were the norm. Food shops in towns are expensive and choice is limited (except in pasta – in one supermarket we found at least 50 varieties); if food is bought in country towns the market is the best source.

R.J. Bowser

L.W. Tunbridge

Medical

Considering that the expedition was based close to the type area of one of the most deadly virus diseases known to man, Oroya Fever, the medical officer feels it something of a personal triumph to have 'brought 'em back alive'. Fortunately this feeling, and the one we all felt on venturing into that part of the world (something close to paranoia) was totally unfounded as we later learnt that the disease and the sandfly bearer had virtually died out in this century.

Biting insects were in fact remarkably uncommon west of the Amazon basin, due mainly to

the lack of vegetation. Our first camp at Pirhuacocha, close to the continental divide at 4,500m, was a remarkably healthy place once we acclimatized to the altitude. Everyone here suffered to a greater or lesser extent from altitude sickness (soroche) particularly as we came up from almost sea level in a day. The symptoms of insomnia, headache, lack of breath, apathy and even vomiting in some cases were treated with Doriden, Codis and rest. Things on average improved greatly after four or five days and work rate and fitness improved to about 75 percent of sea level performance after six weeks to two months. Insomnia still remained a problem, however, and most people preferred to stay on Doriden till the third month.

Intestinal disorders constituted far and away the most common complaint, almost all of which responded to Lomotil (with or without Neomycin) and Streptotriad, usually in that order. Judging by the frequency of occurrence of diarrhoea, the second camp at Huagapo was less healthy than the first; whether this was due to the fact that the water which we drank the water which we also spent a good deal of time wading about in, inside the cave, or that we started eating quite a lot of local produce, is a moot point. On balance it was probably the latter, and the Portasyl water sterilizer pump seems to have been very effective.

A miscellany of minor problems included fleas, piles, toothache and snow-blindness, none of which proved serious, and on the whole the standard of health was high, perhaps in part due to our good diet and daily vitamin intake, usually Ferrograd-C and Surbex-T. Another factor worth considering in assessing the physiological health of the expedition is the part played in maintaining this by the psychological health of everyone. This was good on the whole; in other words it never actually got to blows at any stage. The isolation and small number of the party, 4 then 6 and finally 5, was such that we relied on the party as a whole and were not able to split into cliques. The odd case of altitude apathy and mild neurosis did show itself but the one case of paranoid schizophrenia that I did expect did not materialize so I never in fact got to use the strait-jacket. Sad....

G. Wadge